

## CLAIMS

I claim:

1           1.       An apparatus comprising:  
2           a memory;  
3           a plurality of functional units that transfer data to and from the memory;  
4           a crossbar that provides a data path from each unit to the memory, wherein the  
5 crossbar comprises an arbitration unit to monitor data traffic generated by each of the  
6 plurality of functional units through the crossbar and assigns a priority to each functional  
7 unit based on the data traffic.

1           2.       The apparatus defined in claim 1, wherein the arbitration unit monitors  
2 data traffic from each functional unit by monitoring how often each functional unit  
3 transfers data through the crossbar.

1           3.       The apparatus defined in claim 1, wherein the arbitration unit monitors  
2 data traffic from each functional unit by monitoring the type of data that each functional  
3 unit transfers.

1           4.       The apparatus defined in claim 1, wherein the arbitration unit uses a  
2 programmable priority scheme and a fixed priority scheme.

1           5.       The apparatus defined in claim 4 wherein the fixed priority scheme  
2 comprises a round robin scheme that rotates the top priority designation among at least  
3 some of the plurality of units.

1           6.       The apparatus defined in claim 4 wherein the programmable priority  
2 scheme makes changes based on actual traffic statistics.

1           7.       The apparatus defined in claim 4 wherein the arbitration unit uses a  
2 number of rotating slots, each programmed to assign priority to any one of the plurality of  
3 functional units.

1           8.       The apparatus defined in claim 7 wherein the arbitration unit grants access  
2 to one functional unit if the one functional unit makes a request while the arbitration unit  
3 indicates that the one functional unit is at one of the number of rotating slots having a  
4 highest priority.

1           9.       The apparatus defined in claim 8 wherein the arbitration unit only grants  
2 access if all necessary resources requested by the one functional unit are available.

1           10.      The apparatus defined in claim 8 wherein the arbitration unit increments a  
2 slot count to change the highest priority to another of the rotating slots after granting  
3 access to the one functional unit.

1           11.     The apparatus defined in claim 8 wherein the arbitration unit uses the  
2     fixed priority scheme to grant access to one of the plurality of functional units when the  
3     one functional unit makes a request, is not assigned to a slot with the highest priority, and  
4     a functional unit with the highest priority is not making a request or a desired resource of  
5     the functional unit with the highest priority is not available.

1           12.     The apparatus defined in claim 1 further comprising:  
2             a central processing unit (CPU); and  
3             an access bus coupled to the CPU and plurality of functional units, the access bus  
4     being independent of the data path.

1           13.     The apparatus defined in claim 1 wherein one of the plurality of functional  
2     units comprises another crossbar.

1           14.     The apparatus defined in claim 1 wherein the arbitration unit further  
2     comprises a direct memory access (DMA) port request unit that allows access priorities  
3     to the memory to be programmably defined.

1           15.     The apparatus defined in claim 1 wherein the arbitration unit further  
2     comprises statistics registers that indicate usage of the data paths.

1           16.     The apparatus defined in claim 15 wherein the statistics registers store a  
2     count of the number of data transfers through the crossbar.

1           17.     The apparatus defined in claim 15 wherein the arbitration unit dynamically  
 2     adjusts the priority assigned to each functional unit based on bandwidth demand requests  
 3     by each functional unit.

1           18.     The apparatus defined in claim 15 wherein the arbitration unit dynamically  
 2     adjusts the priority assigned to each functional unit based on delays in getting requests  
 3     served.

1           19.     A method for data transfer arbitration comprising:  
 2             monitoring data transfers for a plurality of devices; and  
 3             assigning a priority to each device corresponding to the amount of data transfers  
 4     generated by the device.

1           20.     An apparatus for data transfer arbitration comprising:  
 2             means for monitoring data transfers for a plurality of devices; and  
 3             means for assigning a priority to each device corresponding to the amount of data  
 4     transfers generated by the device.